Table 1 The kinetic rate expressions of all processes in ASM3-ON

No.	Processes	Kinetic rate expressions (ρ_i)
1	Hydrolysis	$k_H[(X_S/X_H)/(K_X+X_S/X_H)]X_H$
2	Aerobic storage on S_S	$k_{STO}\{[S_O/(K_O+S_O)]\times[S_S/(K_S+S_S)]\}X_H$
3	Aerobic storage on UAP	$k_{USTO}\{[S_O/(K_O+S_O)]\times[S_{UAP}/(K_{UAP}+S_{UAP})]\}X_H$
4	Aerobic storage on BAP	$k_{BSTO}\{[S_O/(K_O+S_O)]\times[S_{BAP}/(K_{BAP}+S_{BAP})]\}X_H$
5	Anoxic storage on S_S	$k_{STO}\eta_{NO}\{[K_O/(K_O+S_O)]\times[S_{NO}/(K_{NO}+S_{NO})]\times[S_S/(K_S+S_S)]\}X_H$
6	Anoxic storage on UAP	$k_{USTO}\eta_{NO}\{[K_O/(K_O+S_O)]\times[S_{NO}/(K_{NO}+S_{NO})]\times[S_{UAP}/(K_{UAP}+S_{UAP})]\}X_H$
7	Anoxic storage on BAP	$k_{BSTO}\eta_{NO}\{[K_O/(K_O+S_O)]\times[S_{NO}/(K_{NO}+S_{NO})]\times[S_{BAP}/(K_{BAP}+S_{BAP})]\}X_H$
8	Aerobic growth of X_H	$\mu_H\{[S_O/(K_O+S_O)]\times[S_{NH}/(K_{NH}+S_{NH})]\times[S_{ALK}/(K_{ALK}+S_{ALK})]\times[(X_{STO}/X_H)/(K_{STO}+X_{STO}/X_H)]\}X_H$
9	Anoxic growth of X_H	$\mu_H\eta_{NO}\{[S_O/(K_O+S_O)]\times[S_{NO}/(K_{NO}+S_{NO})]\times[S_{NH}/(K_{NH}+S_{NH})]\times[S_{ALK}/(K_{ALK}+S_{ALK})]\times[(X_{STO}/X_H)/(K_{STO}+X_{STO}/X_H)]\}X_H$
10	Aerobic endogenous respiration of X_H	$b_{H,O}[S_O/(K_O+S_O)]X_H$
11	Anoxic endogenous respiration of X_H	$b_{H,NO}\{[K_O/(K_O+S_O)]\times[S_{NO}/(K_{NO}+S_{NO})]\}X_H$
12	Aerobic growth of X_{STO}	$b_{STO,O}[S_O/(K_O+S_O)]X_{STO}$---$b_{STO,O}\geq b_{H,O}$
13	Anoxic growth on X_{STO}	$b_{STO,NO}\{[K_O/(K_O+S_O)]\times[S_{NO}/(K_{NO}+S_{NO})]\}X_{STO}$---$b_{STO,NO}\geq b_{H,NO}$
14	Aerobic growth of X_A	$\mu_A\{[S_O/(K_{A,O}+S_O)]\times[S_{NH}/(K_{A,NH}+S_{NH})]\times[S_{ALK}/(K_{A,ALK}+S_{ALK})]\}X_A$
15	Aerobic endogenous respiration of X_A	$b_{A,O}[S_O/(K_{A,O}+S_O)]X_A$
16	Anoxic endogenous respiration of X_A	$b_{A,NO}\{[K_O/(K_{A,O}+S_O)]\times[S_{NO}/(K_{A,NO}+S_{NO})]\}X_A$
17	Ammonification of DON	$k_aS_{ND}X_H$
18	Hydrolysis of entrapped organic nitrogen	$\rho_1(X_{ND}/X_S)$